Survey on Various Initiatives and Challenges of Mobile based Public Services in India

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Abstract— This paper surveys the various initiatives and challenges of Mobile based Public Services in India. Mobile based channels e.g. SMS, USSD, IVRS, GPRS/3G and Mobile Applications using these channels are being explored for public services delivery. The DeitY (Department of Electronics and Information Technology), Government of India in collaboration with CDAC Mumbai (Centre for Development of Advanced Computing), has established a centralized platform MSDP (Mobile e-Governance Services Delivery Platform) to facilitate this. Department is also considering single point of access e.g. a single number (166) for all the channels and for all the public services at central as well as the state specific public services.

This paper discusses various challenges addressed or still to be addressed by this centralized platform to cater its services to a very vast and diverse country, India. This paper also discusses various models of routing of data/information from various departments to the citizens and vice versa through mobile channels.

Index Terms— SMS, USSD, IVRS, e-Governance, m-Governance, Services, Notifications, Mobile Applications, App Store, Short Code, Long Code, MSDP

1 INTRODUCTION

MSDP combines mobile based channels (SMS, USSD, IVRS, GPRS/3G and Mobile Applications) and provide a unified view to the citizen and the government departments.

One common thing with all these channels is that data/information is either being pushed to the citizen by the departments or being pulled by citizens from various departments (State/Central).

SMS (Short Message Service) is a short message consisting of 160 characters only and is supported by any mobile phone and can be categorised in following types.

- Push SMS (Mobile Terminated)
- Pull SMS (Mobile Originated)

USSD (Unstructured Supplementary Services Data) is a session based service unlike SMS which is a store and forward service. USSD services are provided with two different service features:

- USSN (Unstructured Supplementary Services Notify)
- USSR (Unstructured Supplementary Services Response)

IVRS (Interactive Voice Response System) is a channel for delivering public services through voice.

GPRS/3G provide the access to the Internet.

Mobile Applications are applications developed in some mobile platform language and citizen can download them from App Store and install on the phone and access the services.

2 IDENTIFICATION OF THE DEPARTMENT THROUGH SMS

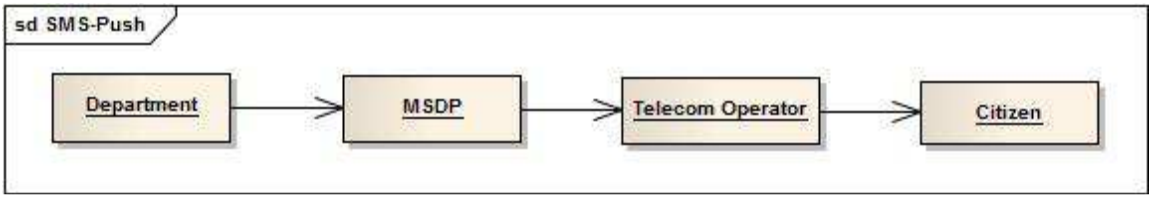
Push SMS (Mobile Terminated) is used by the departments to send alerts/notifications to the citizens related to various services. Here it is required that a particular department must be identified when the citizen receives the SMS. With arrangement with the telecom operator MSDP platform assigns a sender id to the department. When the citizen receives the SMS, he/she can see this sender id and can identify the sending department. The sender Id has the following format: XY-ZZZZZZ. First two characters before hyphen identifies the telecom operator and the circle and the last six characters identifies the department. Here the challenge is that, these six characters should be selected in such a way that the citizen can easily identify the department.

3 USING THE PUSH SMS FACILITY

There are two possible ways in which, department can be provided the push SMS facility:

- Provide this facility through web portal: This is useful for the department where sufficient automation is not there and they want to push the SMSes manually through portal. MSDP platform provides each department separate credentials for login in to the portal (http://services.mgov.gov.in) and use the push SMS facility.
- Provide this facility through programming interface: This way the department which has the back end system automated, can integrate with programmatic API (Application Programming Interface) of MSDP Platform and can push SMS on certain events.

Following diagram shows the flow:

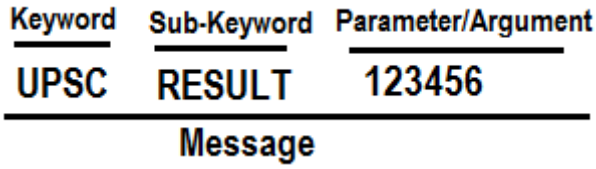


4 USING THE PULL SMS FACILITY

MSDP platform provides one single code (short code / long code)* where the citizens are supposed to send the query SMS(currently 51969/166). To avail the pull SMS facility, the department has to provide following two things:

- SMS format, in which citizen will send the SMS query.
- API of the service to be integrated.

SMS Format and routing mechanism: As there is a single number where SMS for all the services of the departments(Central/State) arrives, there must be some well defined format for SMS creation. SMS format is crucial for the routing of incoming query SMS. Following is the one popular format.



In general, keyword identifies the department, sub-keyword identifies the services of that particular department and parameter/arguments are mostly service specific data. So in case of Central Government department, keyword can uniquely identify the department. For example "UPSC" can be keyword for the services of Union Public Service Commission. Further to this UPSC can use sub-keyword for the specific services e.g. "RESULT" and the parameter/argument can be the Roll Number.

When the SMS reaches to MSDP via telecom operator network, routing of the SMS is easily can be done based on the routing table. Routing table can have unique mapping of the keywords with the respective url of APIs of the department .

KEYWORD	DEPARTMENT API URL
UIDAI	http://uidai.gov.in/smspullapi
UPSC	http://www.upsc.gov.in/smspullapi
...	...

But the case is different for the state government departments. There are various government departments in states which are there in other States also. So keyword alone will not be able to identify the departments uniquely across the states. So in this case we need to have another identifier for the state. One option here was to use the numeric code of the state provided by the DeitY. But remembering the numeric code of the state is difficult for citizens, so other option opted was to use two to three length characters to identify the state. So, for State specific services the keyword will identify that particular state. For example keyword GOA will identify Goa State, MH will identify Maharashtra State. For each state two to three length characters have been finalized and being used. Sub-keyword identifies the specific departments or services directly of that State.

Routing of SMS in this case happens in two ways depending on the following two situations:

1. There is a single server in state to receive all the SMS of that State.
2. There may by a separate server of a particular department or a government organization in the state for example Maharashtra Public Service Commission in Maharashtra.
3. There is a single server for all the services in a particular central government department.

In the first case routing table contains the unique mapping of the keyword for state (two to three characters) with the respecting urls of APIs of the server of that state.

In the second case routing table contains the unique mapping of the keyword for the department with the respective url of API of the department.

Third case is similar to the second case where the routing table contains the unique mapping of the keyword for the department with the respective url of the API of the department.

KEYWORD	DEPARTMENT API URL
MH	http://maharashtra.gov.in/smspullapi
GOA	http://goa.gov.in/smspullapi
MPSC	http://mpsc.gov.in/smspullapi
...	...

In all three cases routing is done based on the keyword(state/department) and forwarding the sms to the mapped url. Once the department receives the SMS, it is the department's decision to how to process the SMS. Department can further route to another server(if there are dedicated servers for different services) or process the message itself. MSDP passes the whole SMS message with other different parameter to the departments. Other parameters passed are:

- Mobile Number
- Time Stamp
- Operator Name
- Area Code
- Message (SMS)

Other parameters apart from the message can be used by the department to further customize the service or to perform some level of authentication. For example, using mobile number passed, the department can ensure that response message are delivered only if the mobile number matches with the registered mobile number.

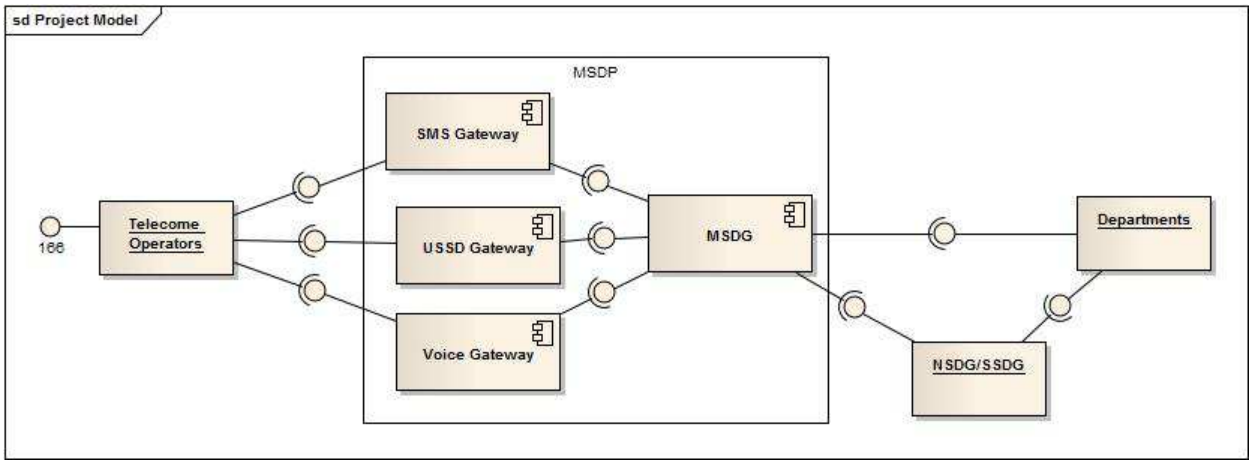
Department's API Integration: To avail the pull SMS facility the department has to provide an API of the service. The API provided by the department may be of various type. For example:

- HTTP GET
- HTTP POST
- Web Service

Depending on the type of API, MSDP platform needs to pass the parameters received in SMS, to the API, in different ways and with using different clients. HTTP interface requires HTTP client, whereas Web Service interface requires the web service client. So the routing table also has various other fields which helps the MSDP to select the client accordingly.

KEYWORD	API-TYPE	DEPARTMENT API URL
MH	WS	http://maharashtra.gov.in/smspullapi
GOA	HTTP	http://goa.gov.in/smspullapi
MPSC	HTTP	http://mpsc.gov.in/smspullapi
...		...

5 COMMON ROUTING ARCHITECTURE FOR ALL THE CHANNELS



Telecom Operator forwards the data received at short code 166 from the citizen, in different formats specific to the channel (SMS / USSD / IVRS) used, to specific gateway (SMS Gateway / USSD Gateway / Voice Gateway). These gateways, after processing the data, forwards to the MSDG(Mobile Services Delivery) [1] gateway which applies the various routing logic and then route the data to the appropriate government department directly or through NSDG / SSDG[2]. The reply from the department is sent back to the citizen through the same path.

6 USING USSN FACILITY

USSN (Unstructured Supplementary Services Notify) can be used by the departments to send alerts/notifications to the citizens related to various services in a flash message. Similar to SMS, this facility can be provided in the following two ways:

- Provide this facility through web portal. This is useful for the department where sufficient automation is not there and they want to push the USSD message manually through portal.
- Provide this facility through programming interface. This way the department which has the back end system automated, can integrate with programmatic API (Application Programming Interface) to push USSD message.

Message flow is also the same as that of SMS.

7 USING USSR FACILITY

USSR (Unstructured Supplementary Services Response) is similar to SMS pull in the functionality, but the difference is that, instead of sending a message to the short code, here short code itself is dialled by prefixing with * and postfixing with # for example dialling *166#. Once dialled, citizen gets a menu for services on the screen. Citizen needs to select the menu number to select a particular service. Challenge in case of USSR is to create a single list of menu for thousands of services of all the states and the central government departments.

One solution to this problem is that short code can be appended with unique code for the departments in the following way: *166*XYZ#

XYZ can be the unique code for department. For example if MPSC has the unique code 100. Then by dialling *166*100# will provide the menu of the services of MPSC.

8 SHORT CODE VS. LONG CODE

Short/long codes are basically a number, which citizen can use to access any service. The short codes has the advantage that it can easily be remembered and this helps in popularizing the codes easily but the biggest disadvantage is that these numbers are telecom operator specific, meaning by, it is tricky to select a short code, as it may available with one operator but may not be available with other operator as the same code might being used by the other operator for some other service. Other big challenge is to get these short code configuration at all the telecom operators and revenue share.

The long code is though difficult to remember but the good part is that the code is to be taken and configured from the only one telecom operator. As USSD allows only three digit number, long code can't be used with long code.

The other major difference in short code and the long code is because of the user's charges for the use of channels(SMS, USSD, IVRS). In case of long code the citizens are charged p2p (person to person) rates. So when the citizen use the channel e.g. SMS he/she are charged according to the channel plan of the citizen. But in case of short code they are not able to go for p2p rates.

The MSDP platform opted for best of both the worlds. The case where the citizens are directly using the channel, it went for short code, with keeping in mind that short codes are easier to remember. There is one case where citizens will not use the channels directly, is while accessing the public services through mobile applications. In this case, long codes can be used and the citizen will be charged only as per their plans.

In case of MSDP, to get a short code uniform across the operators, required intervention from Department of Telecommunications and TRAI (Telecom Regulatory Authority of India) and the short code 166 has been allotted for mobile governance across all the channels and the telecom operators. Another big challenge is to make telecom operator agree for a

minimum uniform rates for channel usage.

9 Common Portal For All The Mobile Channels

Providing the common portal for accessing and managing all the mobile channels is a new kind of initiative. The main web portal http://mgov.gov.in provides the general information about the mobile governance initiative and various integration status with government departments. Other sub-portal is for common services (http://services.mgov.gov.in).

Following are the common features across the mobile channels:

- Registration of the Government Departments
- Manual use of services (e.g. bulk SMS/USSD/Voice through excel sheet)
- Various status of used services.
- Request and approval of sender ids.
- Request for increasing credit limit.

10 Mobile Applications and AppStore

[1] have described in detail about the various initiatives in India for Mobile Applications development and the application store and arising business model around it. It is required to have the following views of the application store:

- Citizen's View
- Department's View
- Developer's View
- Administrator's View

Citizens should either go to the app store portal or can browse the applications in the app store installed on the phone as an application and browse various applications and download the application of choice. Only the applications which citizens can use, are available for browse by the citizen. Citizens can download the free applications directly and paid applications after payment. There are certain applications which are only relevant to the department officials.

11 Challenges in getting the unform service charges for short code based pull channels

It is very difficult to get the uniform service charges for the short code based pull channels until it is intervened by DoT/TRAI. To avoid this, one solution can be to start the conversation with a missed call. Once the citizen gives a missed call, then a SMS or USSD menu can be pushed to the citizen and start the conversation.

12 Local Language Support

SMS Gateway component of MSDP, supports messages in Unicode. So citizens / departments can use the SMS services

in the local languages, provided mobile handset supports the Unicode. The language support in USSD is being tested, right now. Both in case of SMS and USSD, the challenge is that the mobile handset may or may not support the Unicode. One solution to this problem can be that while registration for any service, department may ask / check the Unicode support in the mobile handset of the citizen. If the handset supports Unicode, then it can be used for SMS / USSD in local languages. Otherwise plain English text can be used. For IVRS, citizens are asked for different language options by pressing different keys. Challenge here is to make voice based menu in different languages. Other challenge is to convert text in different languages to speech. Text To Speech Synthesis Systems for Indian Languages (TTS-IL) [7] developed by CDAC, is being used for this purpose. Language support in the mobile applications developed, are constrained by the language support in that particular language and handset.

13 CONCLUSIONS

Mobile Governance is catching up very fast in the India. Various mobile based channels are being leveraged to deliver the services to the citizens through mobile devices. SMS is most widely used for status, alerts and notifications. USSD is now catching up slowly. USSD has great potential for mobile service delivery as it works even on the low cost handsets with limitation that it works only on the GSM handsets. IVR systems are being used since long time but, now it is being integrated with government department's back -end systems to provide automated service delivery. Location based systems, SIM Toolkits are being explored and are in the pipeline. Mobile Applications are also catching up as the smart phone are available at low cost in India. Mobile Application Store is a big initiative in this direction.

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